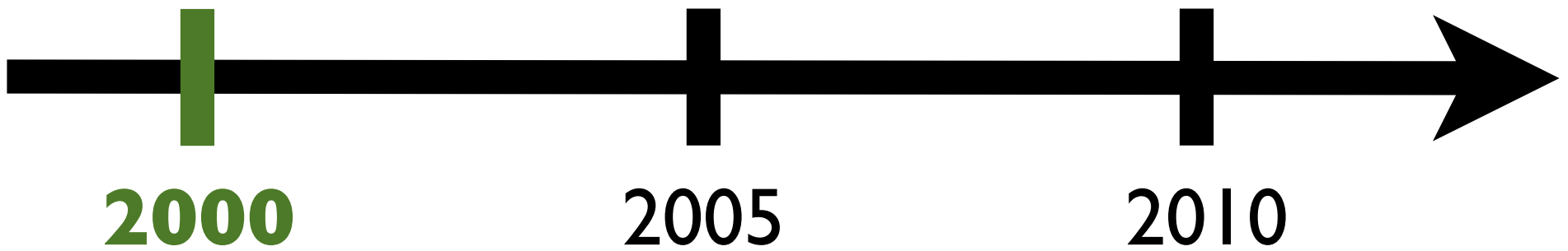
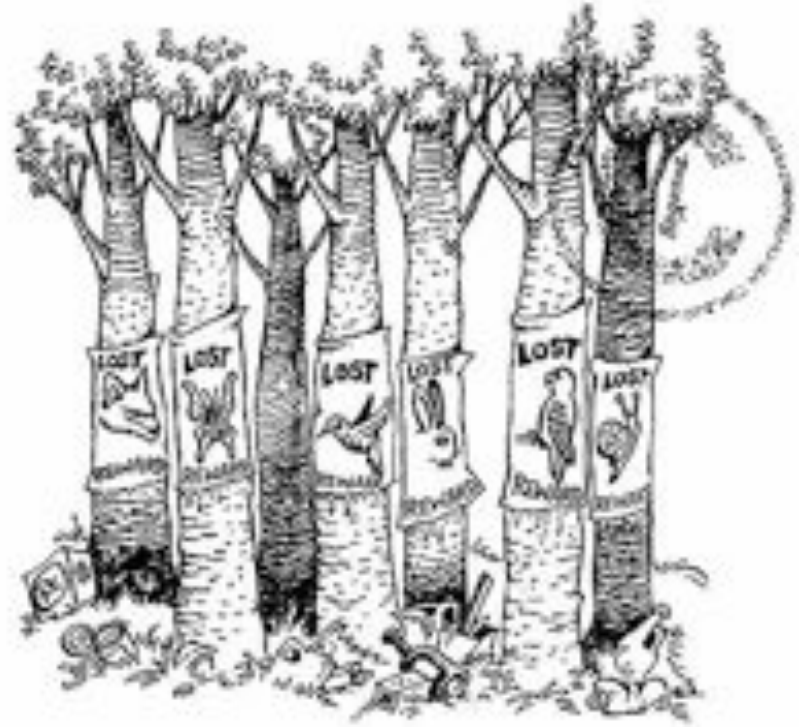
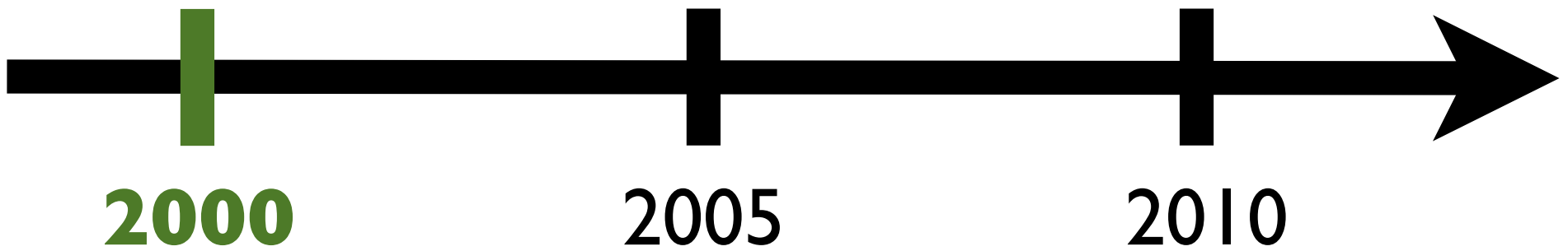




# Biodiversity Impacts on Tropical Forests when Converted into Biofuel Feedstocks

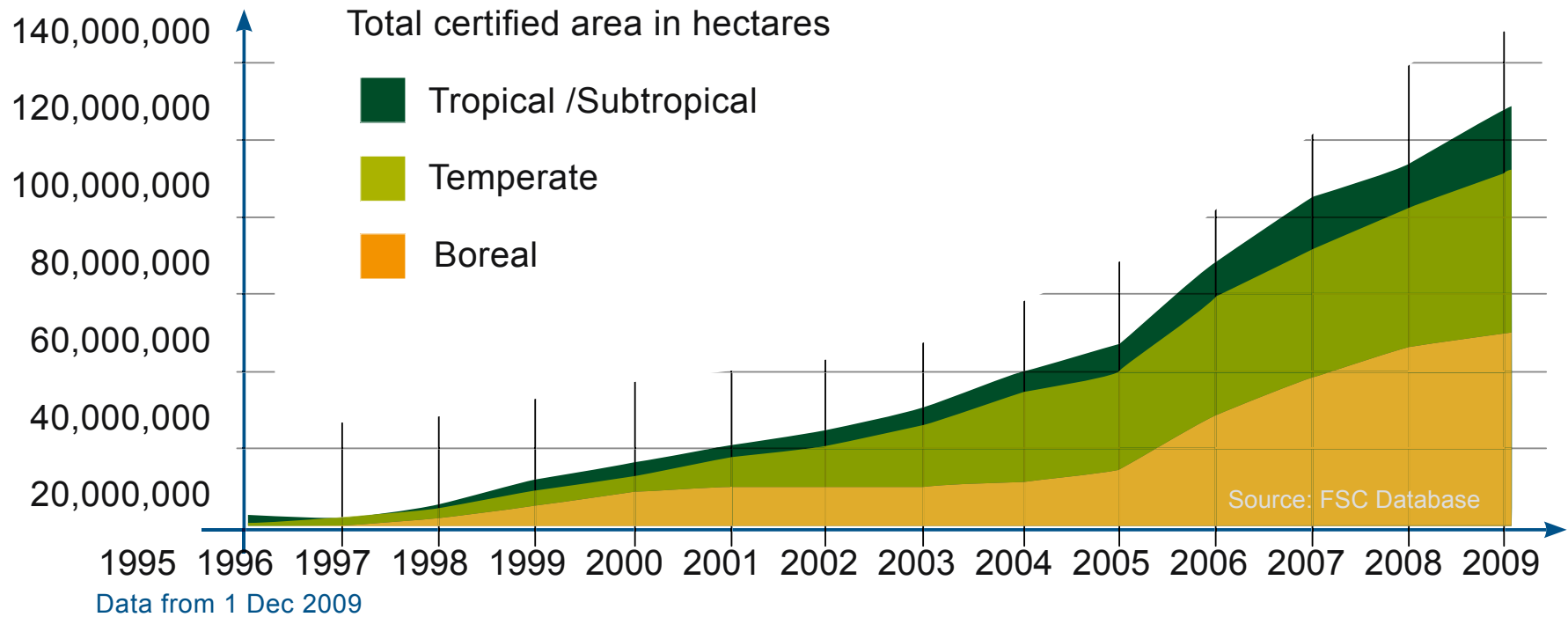
Matthew D. Potts  
University of California  
Berkeley, CA USA





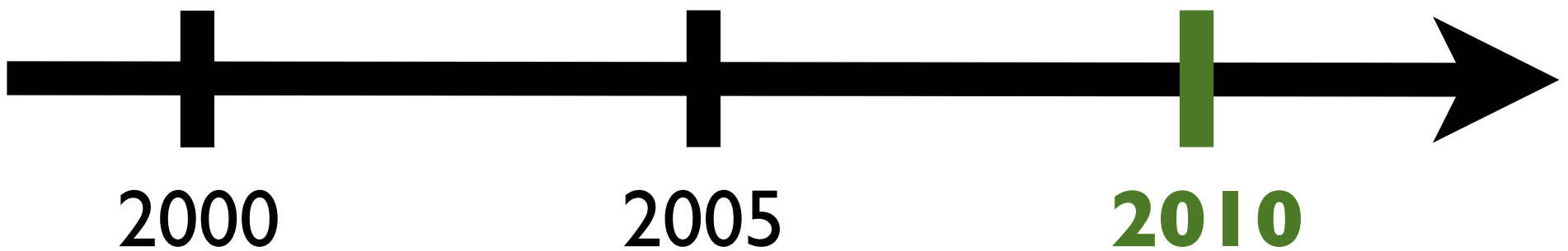
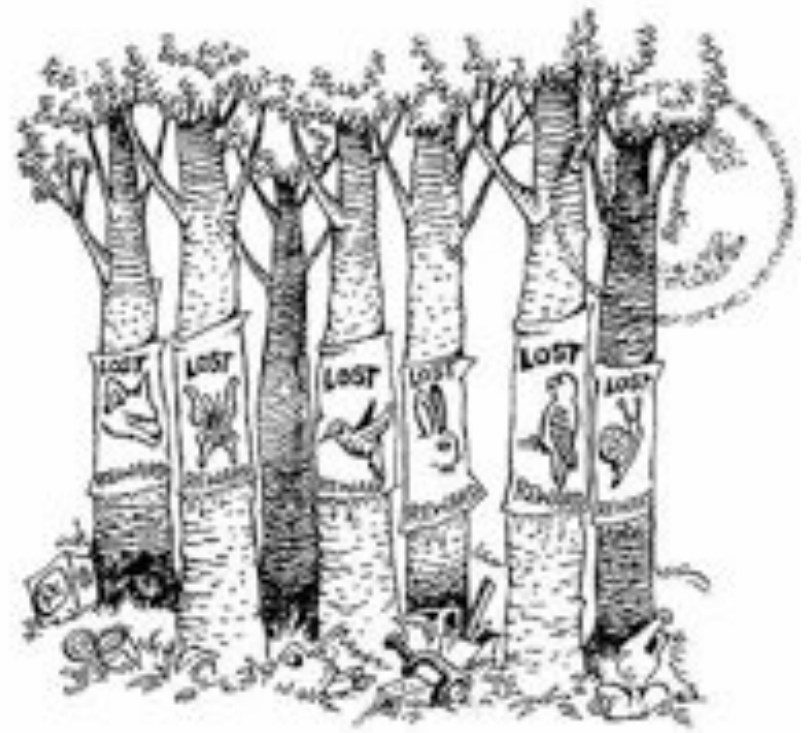


## FSC certified forest area growth



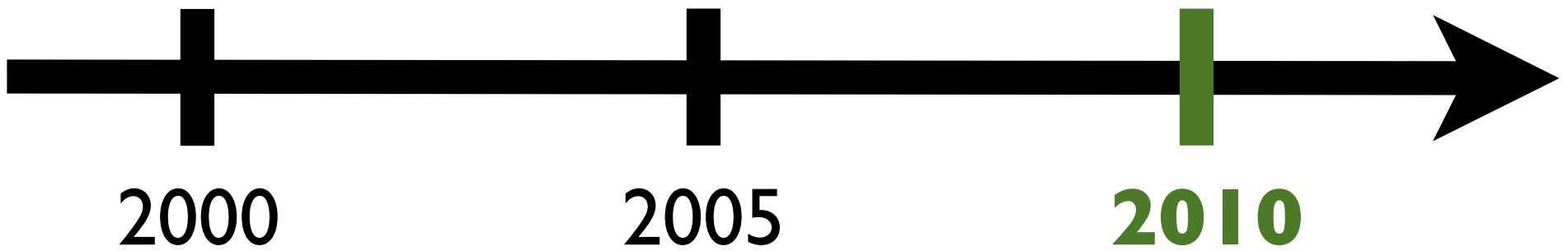


&





# L&CFS



# Avoiding Past Mistakes

## LCFS & Biodiversity in the Tropics

1. Plan Biodiversity Conservation at the **National** Level
2. Ensure Biofuel Production Directly and Indirectly on **Only** Non-Forested Lands
3. Enforce & Develop Best Management Practices

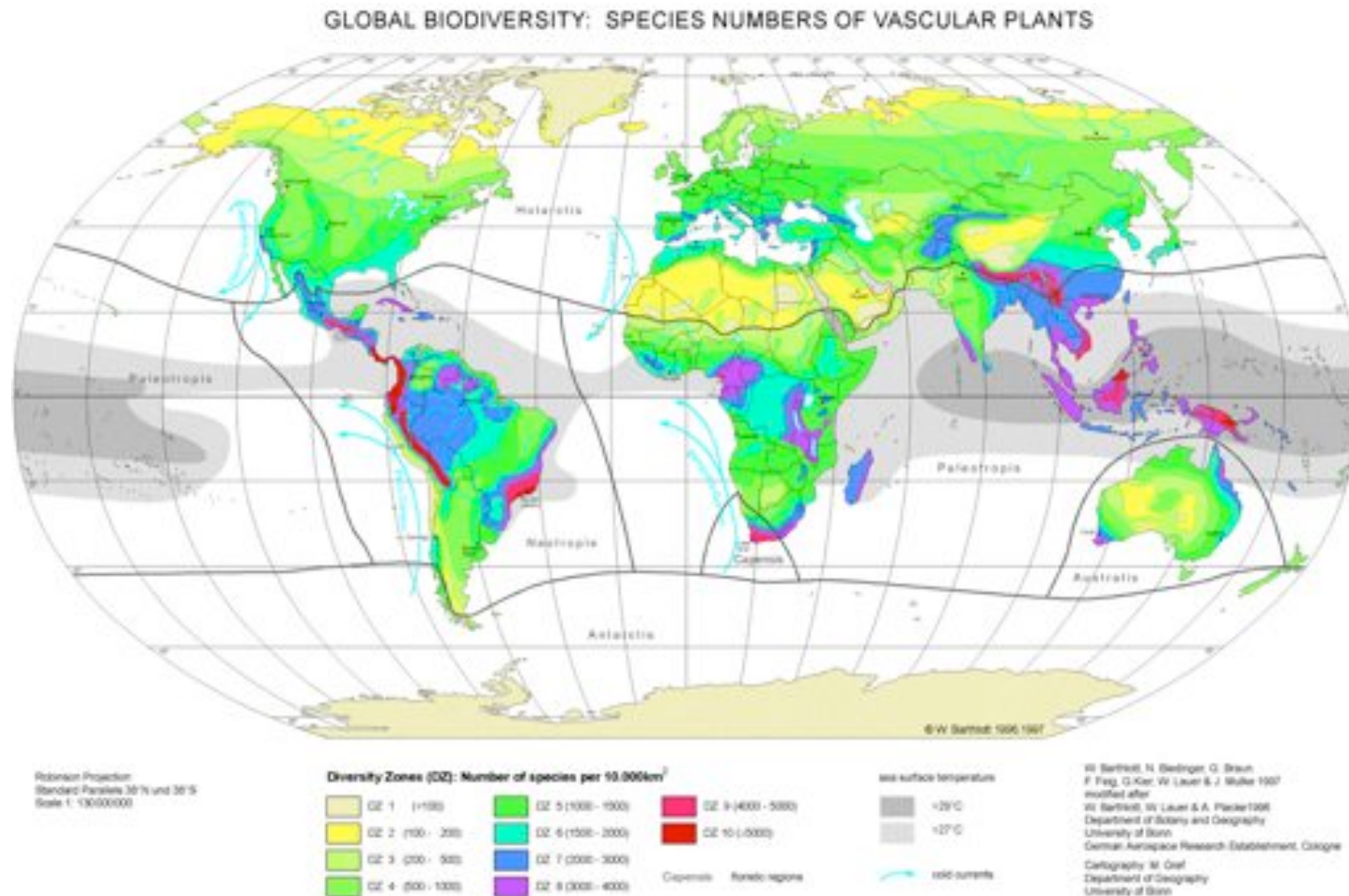
# Outline

- Tropical Biodiversity
- The Oil Palm Example
- Avoiding Past Mistakes



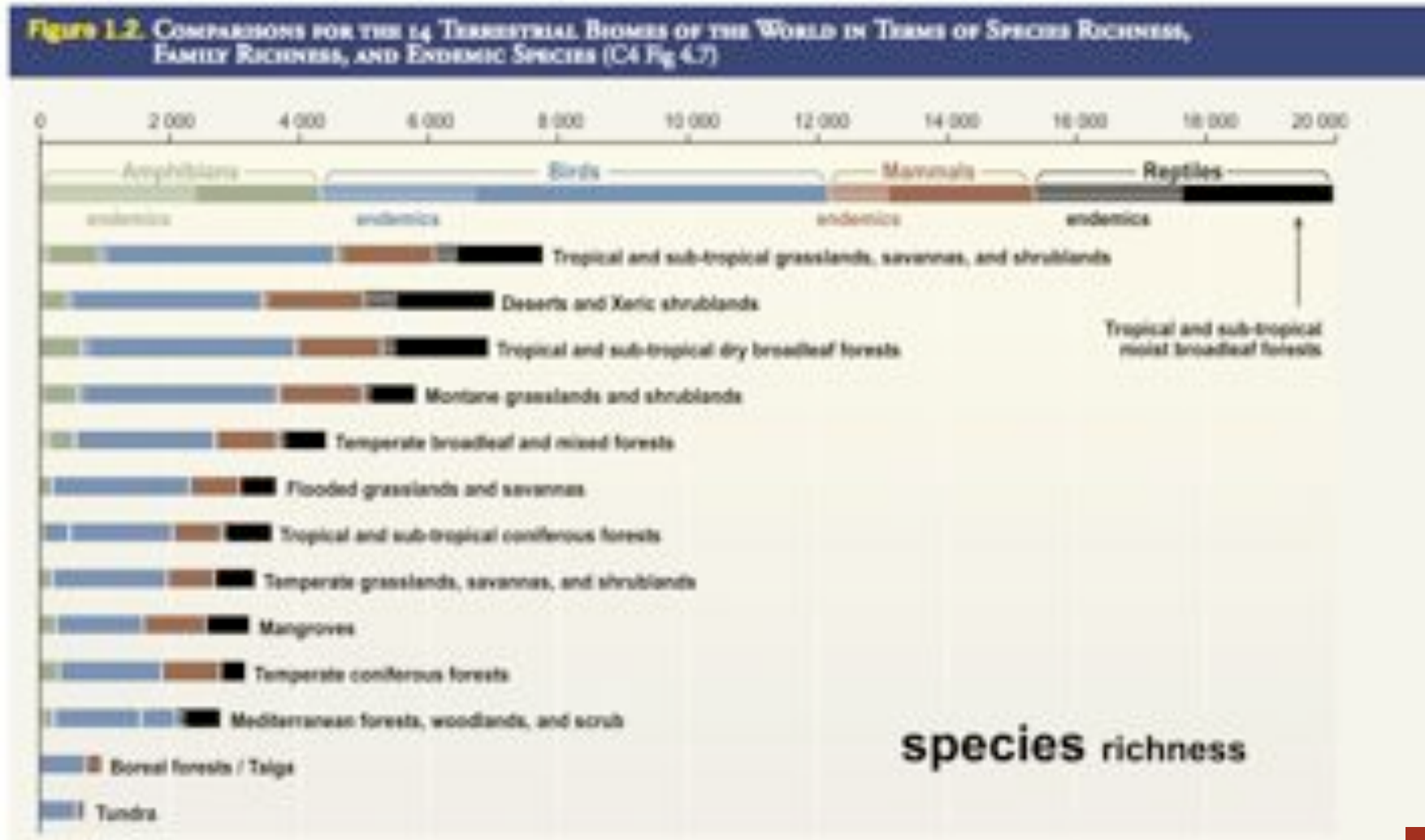
# Tropical Biodiversity

# Biodiversity: Numbers

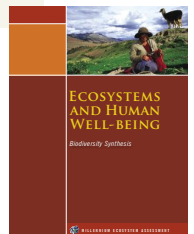


Tropical forests cover 6% of the Earth's land surface yet contain more than half of the Earth's biodiversity.

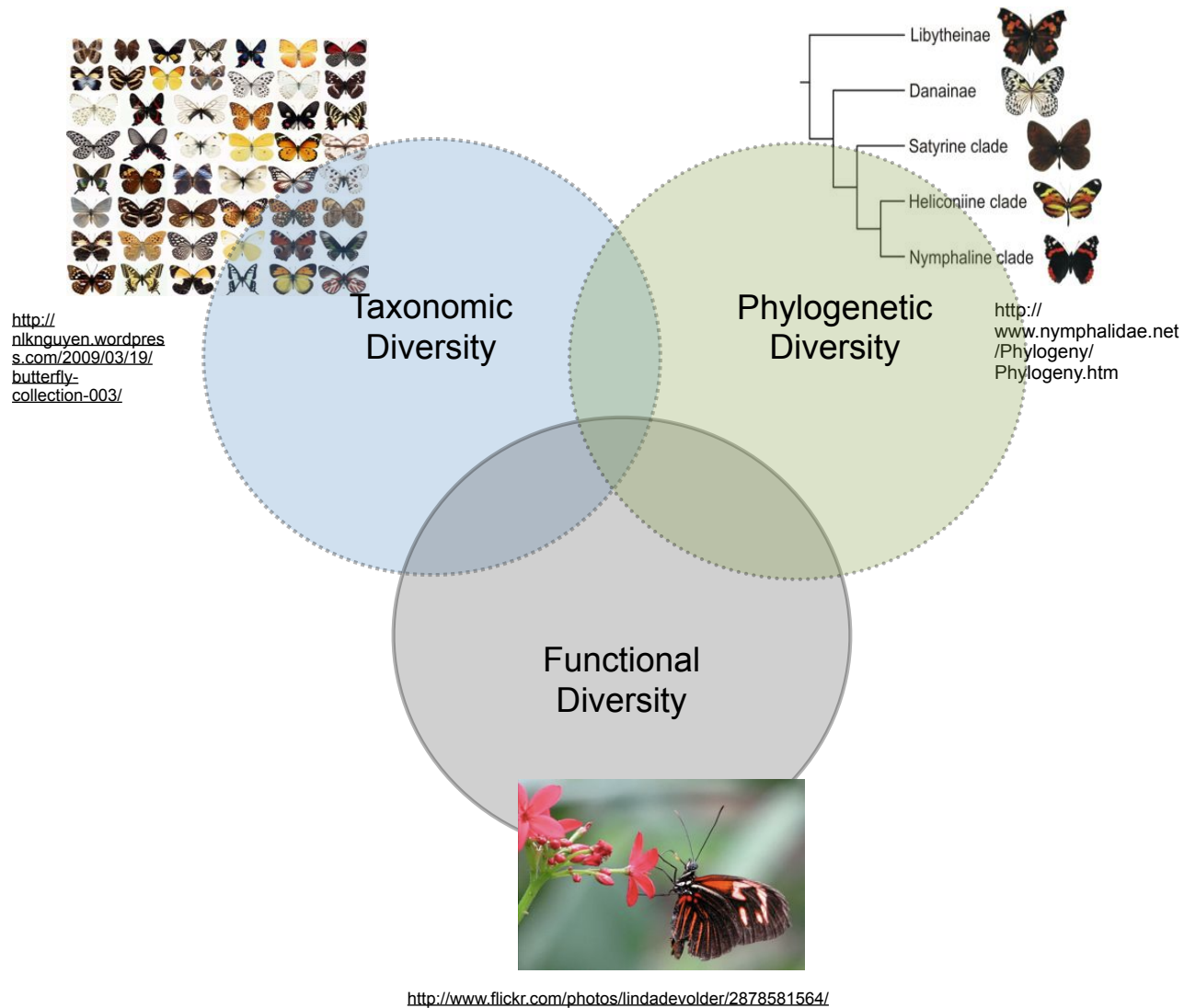
# Biodiversity: Numbers



Biodiversity is unique in the tropics.



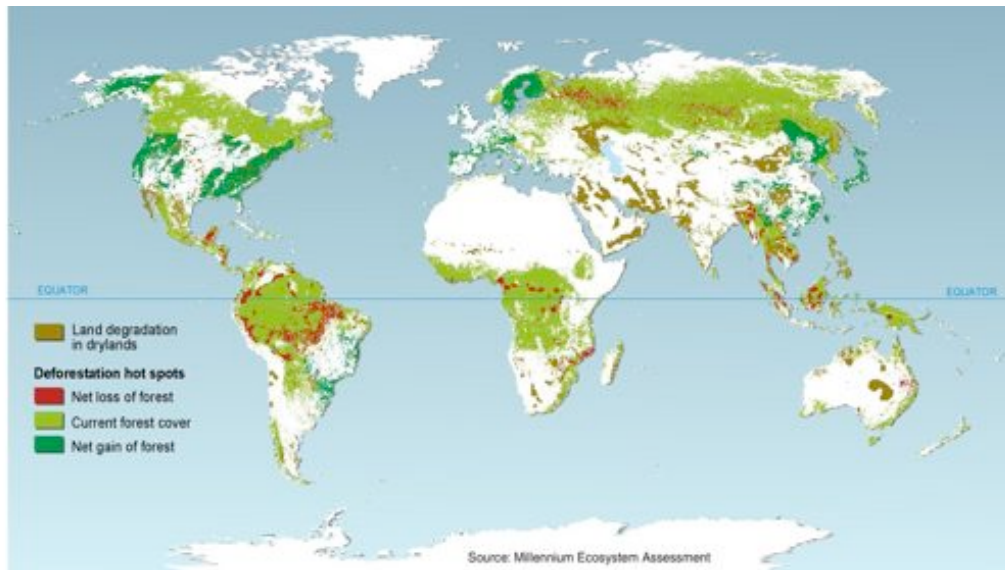
# Biodiversity - Beyond the Numbers



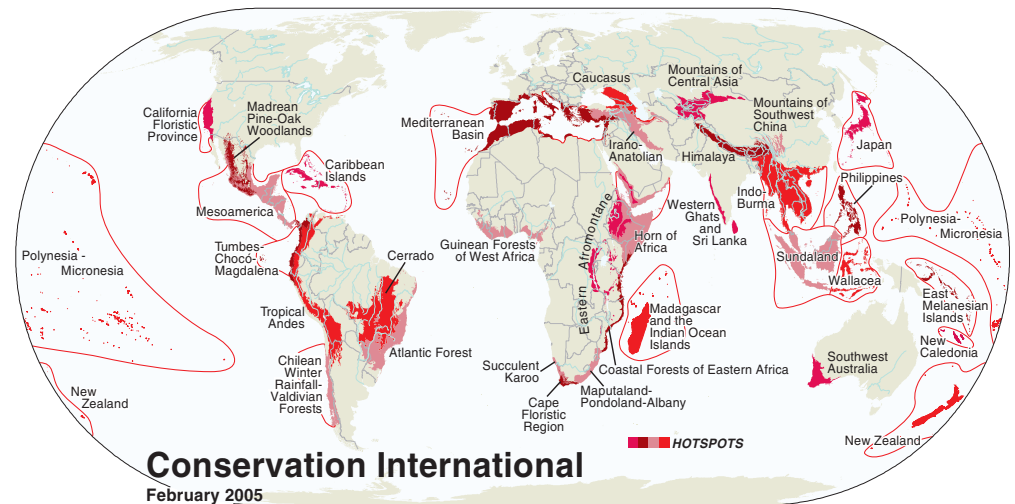
Biodiversity has many facets

# Forest Loss & Biodiversity

## Forest Loss



## Biodiversity Hotspots





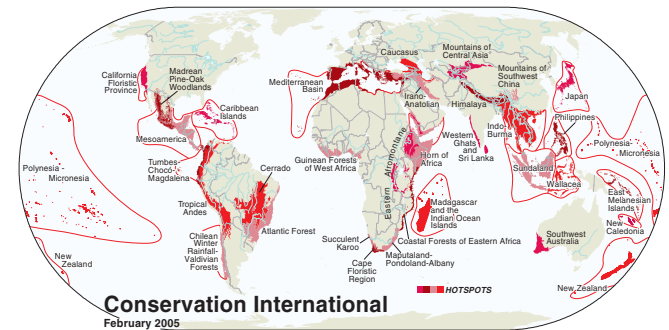
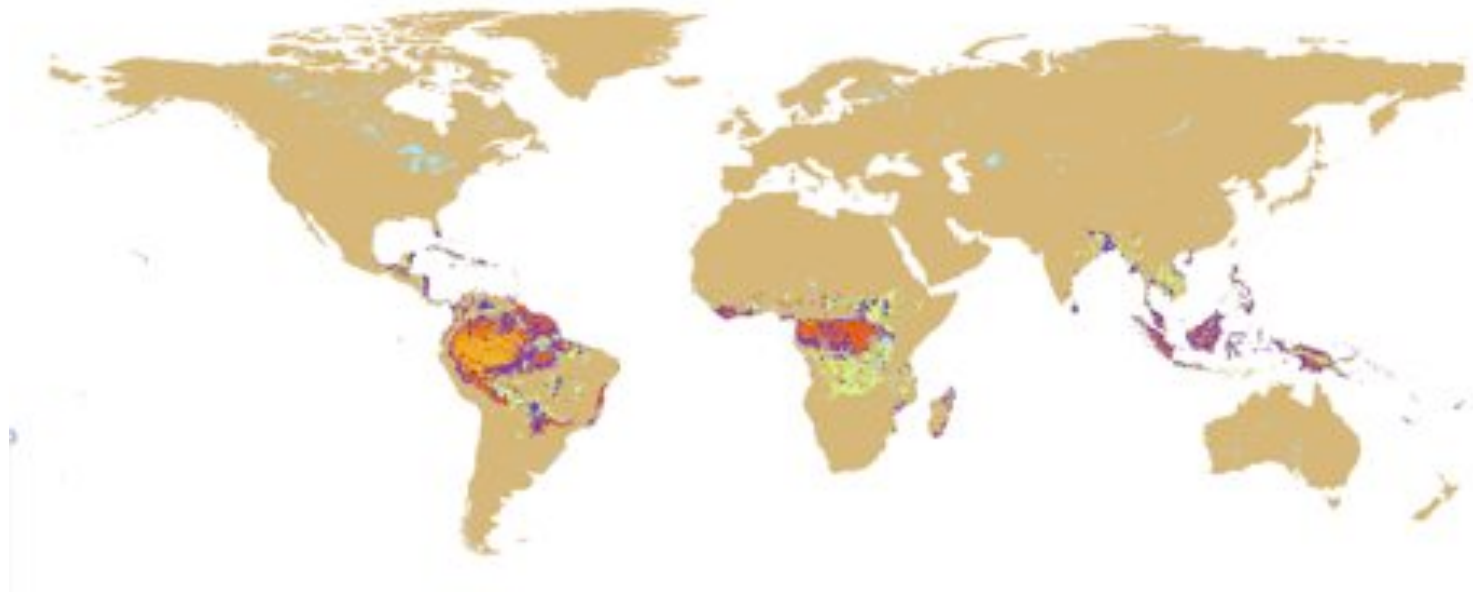
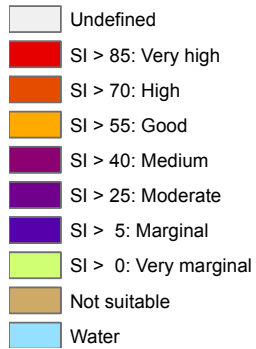
# Oil Palm

# Oil Palm

1. The largest and fastest growing cropland (**oil palm**)
2. Grows in the most biodiverse regions on earth (**tropical lowland rainforests**)

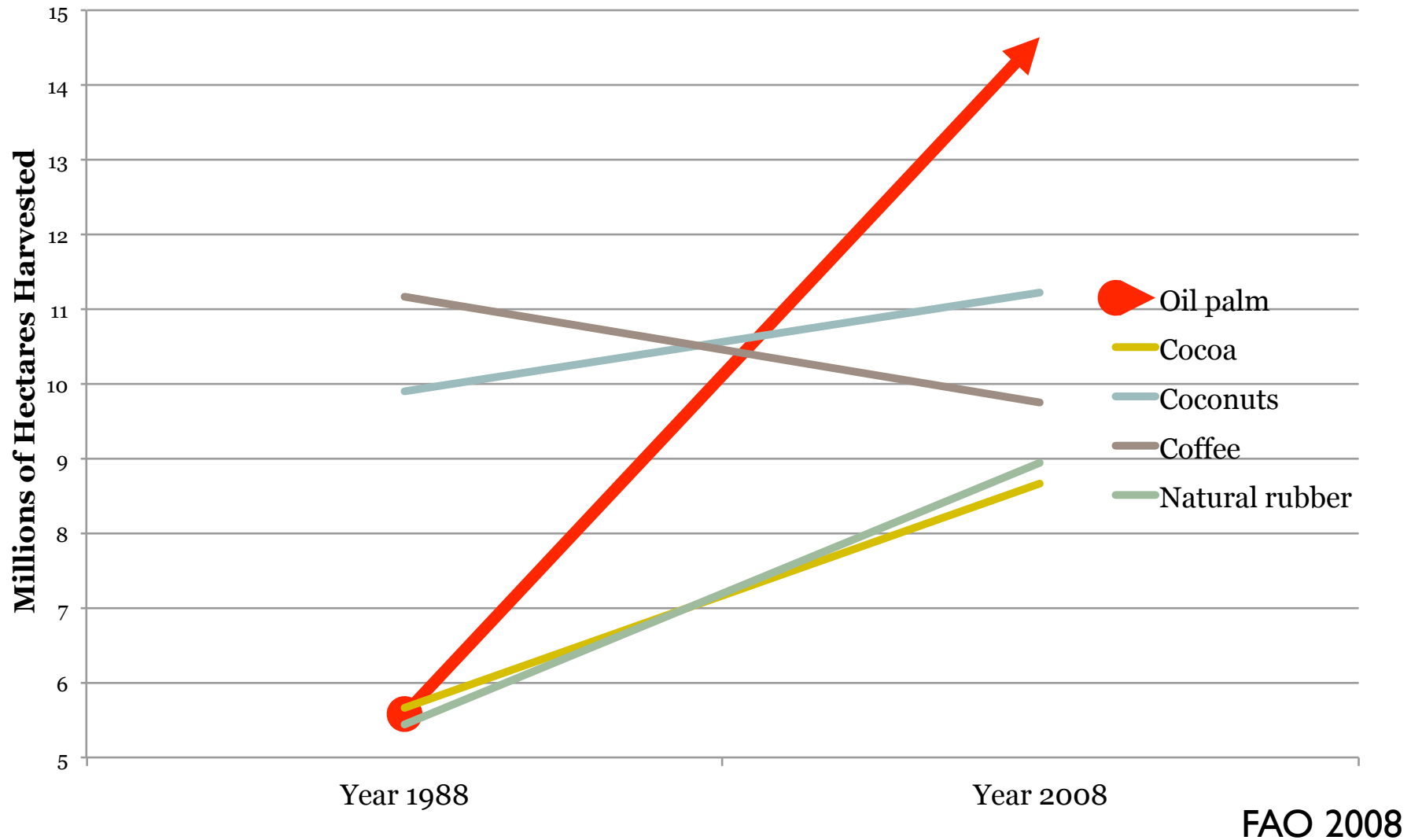
# Oil Palm Suitability

## Oil Palm Suitability



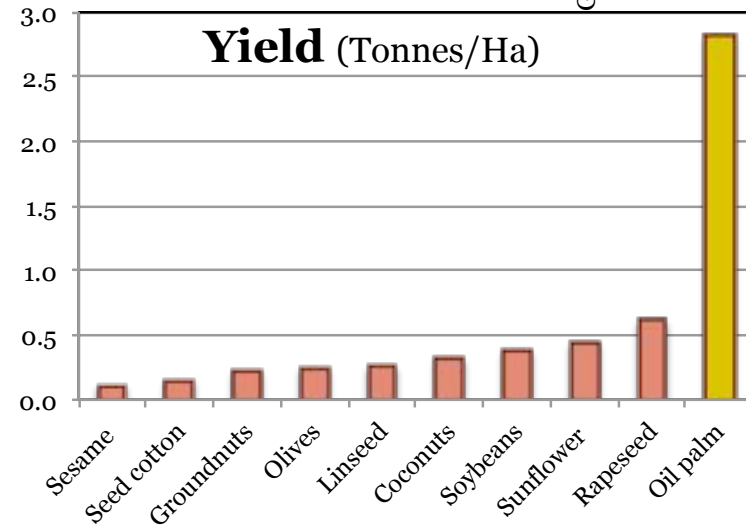
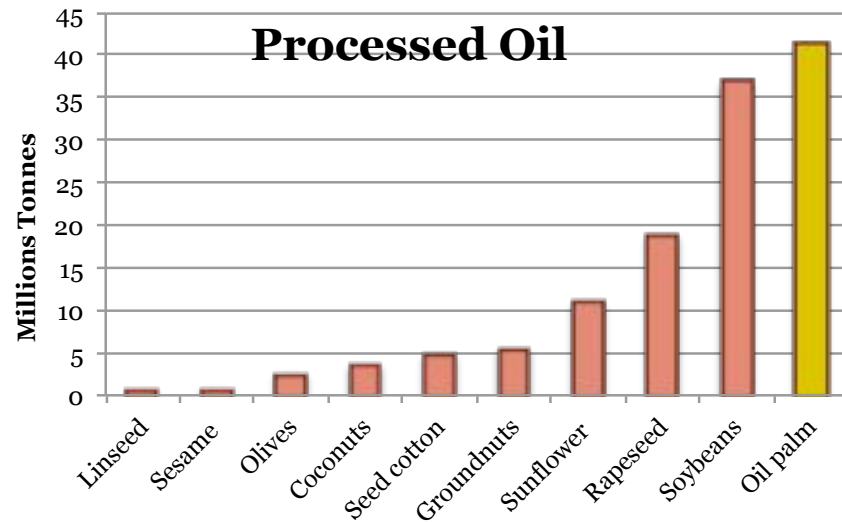
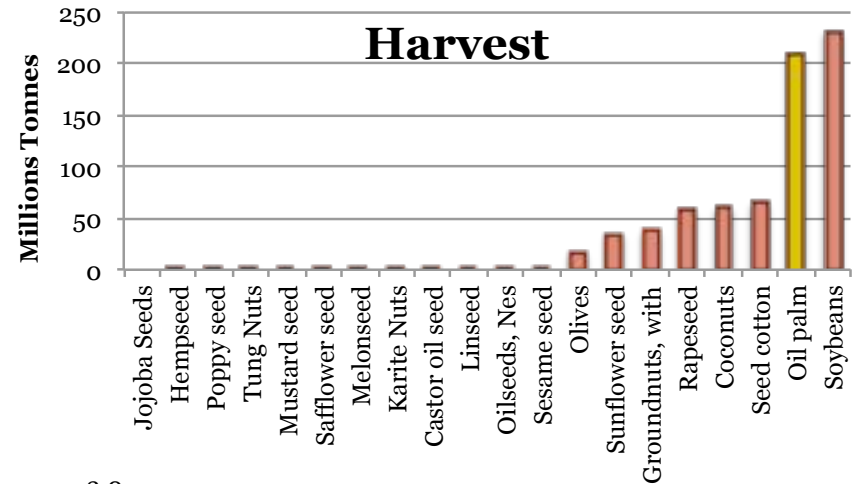
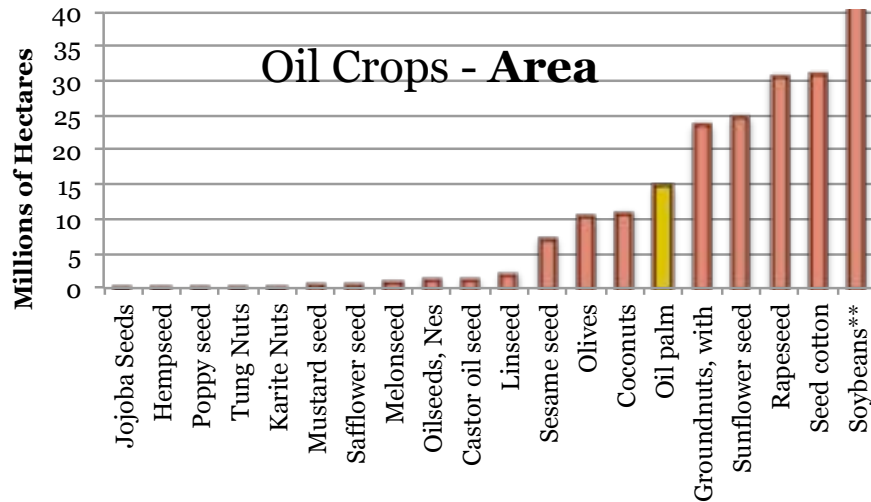
# Oil Palm's Growth

## 20 Years of Growth for the 5 Largest Perennial Crops



# Why Grow Oil Palm

## Unequalled Oil Yields



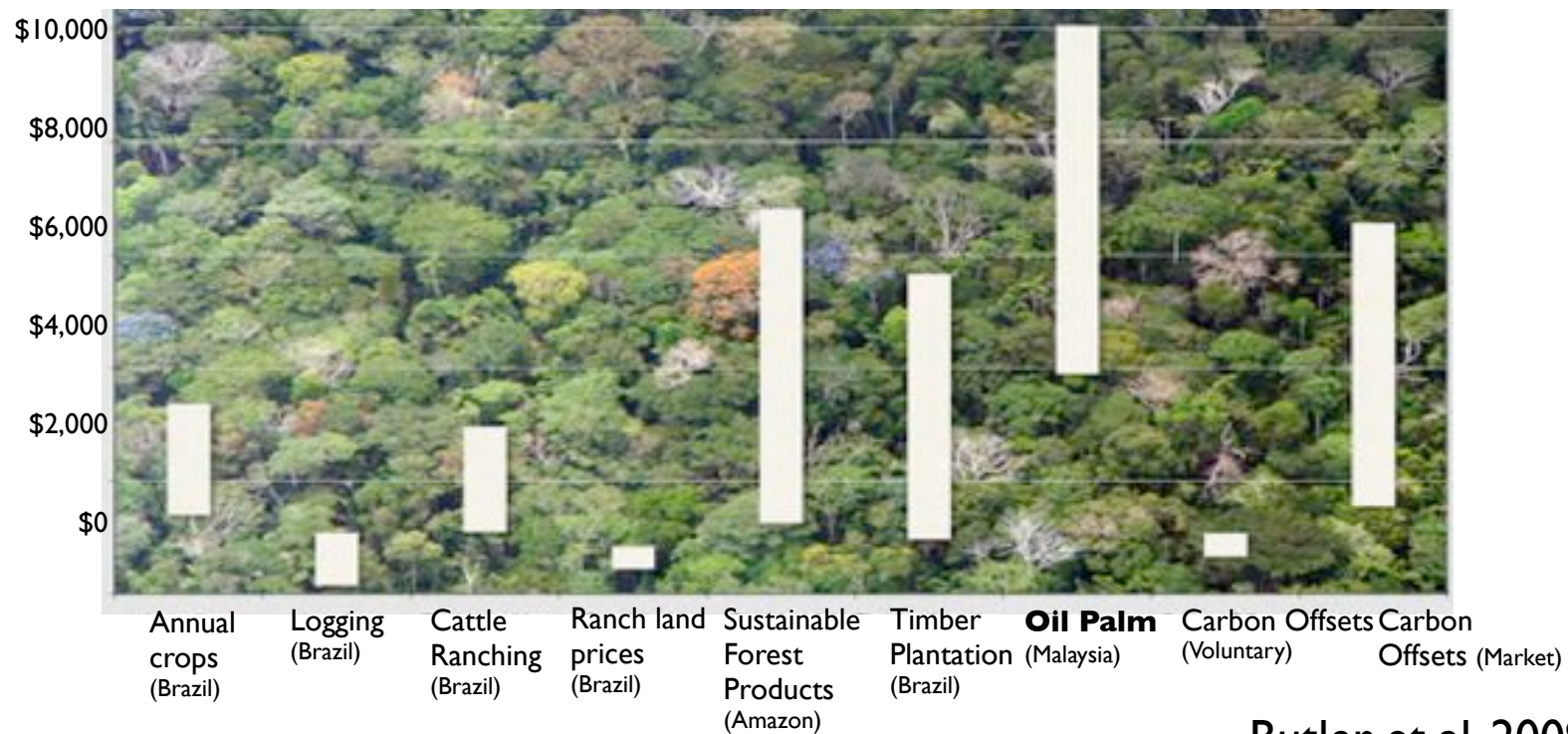
FAO 2008



# Why Grow Oil Palm

The most profitable land use in the tropics

Net present value of land in the Brazilian Amazon in USD/ha



Butler et al. 2009







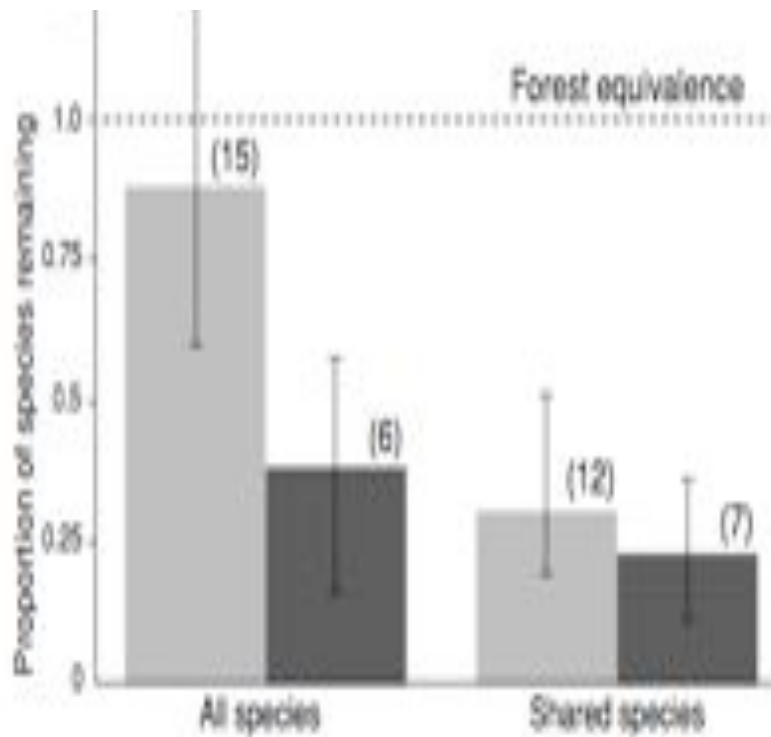




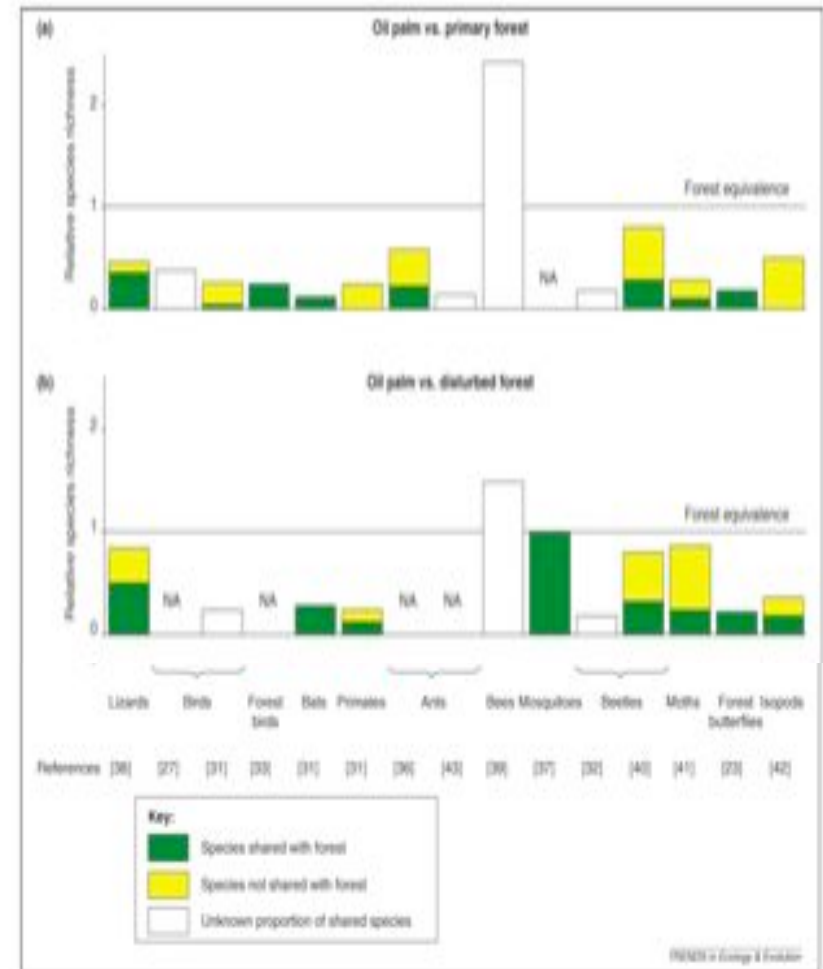


# Biodiversity in Oil Palm

Across all taxa: 15% of *forest* biodiversity was also recorded in palm oil plantations



Danielsen et al 2009



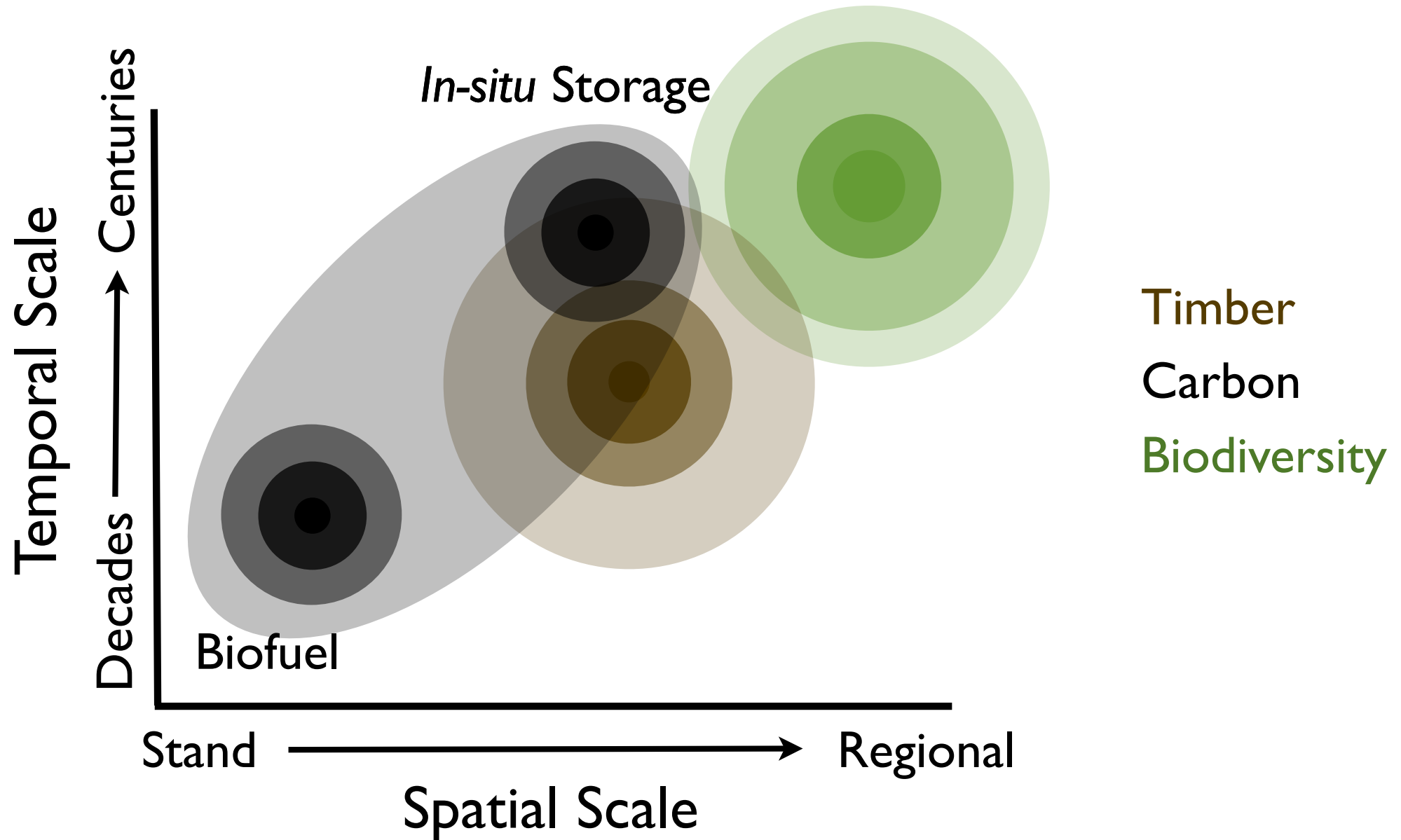
Fitzherbert et al 2007



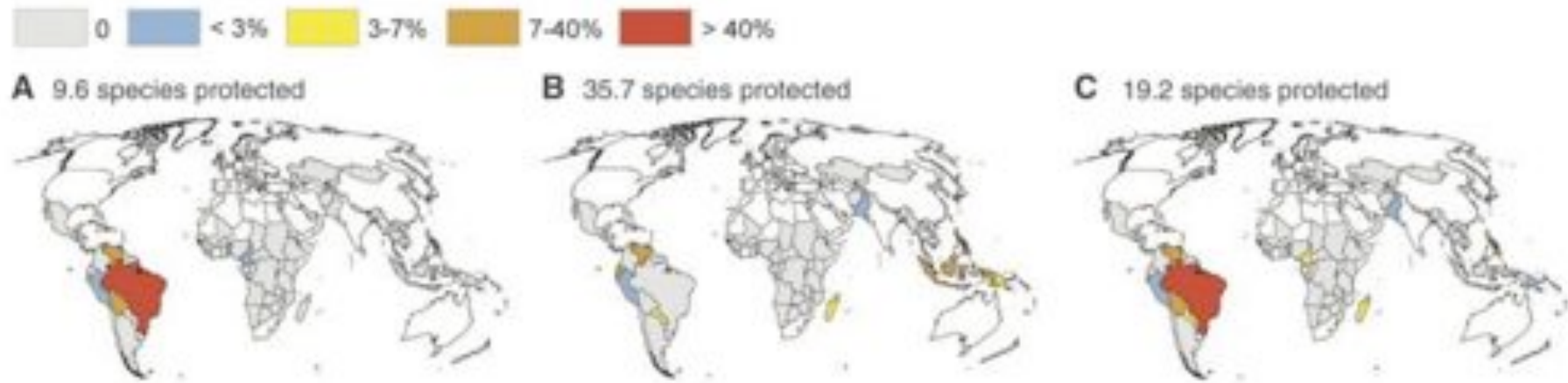
# Avoiding Past Mistakes LCFS & Biodiversity in the Tropics

# Plan Biodiversity Conservation at the **National** Level

## Different Optimal Management Scales



# Plan Biodiversity Conservation at the **National** Level



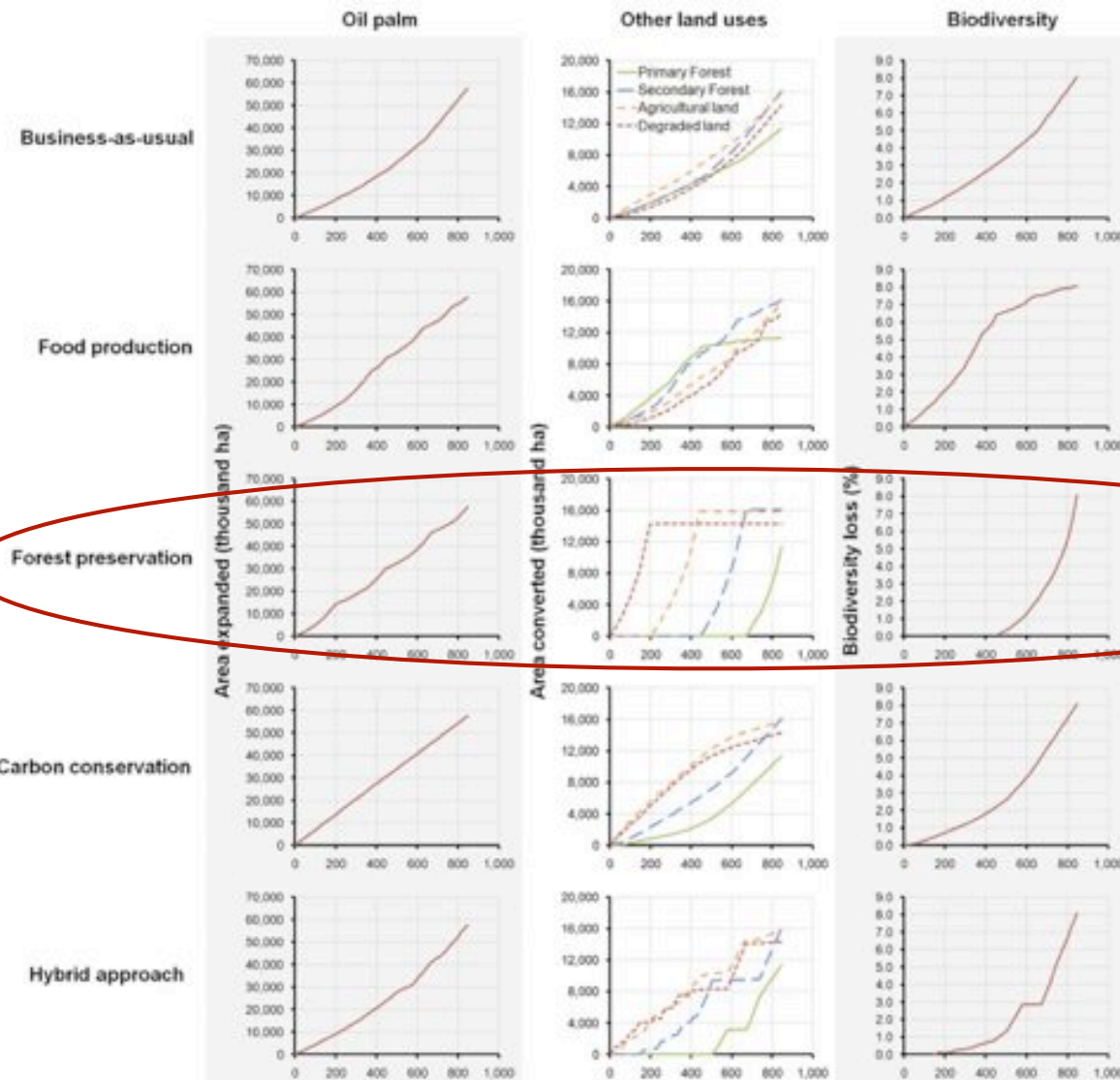
Able to double number of species protected (Panel A vs C) with only a 4 to 8% loss in carbon benefits.

## Harnessing Carbon Payments to Protect Biodiversity

Oscar Venter,<sup>1\*</sup> William F. Laurance,<sup>2,3</sup> Takuya Iwamura,<sup>1</sup> Kerrie A. Wilson,<sup>1</sup>  
Richard A. Fuller,<sup>1</sup> Hugh P. Possingham<sup>1</sup>

4 DECEMBER 2009 VOL 326 SCIENCE [www.sciencemag.org](http://www.sciencemag.org)

# Ensure Biofuel Production Directly and Indirectly on **Only** Non-Forested Lands



Spatially explicit scenario analysis for reconciling agricultural expansion, forest protection, and carbon conservation in Indonesia

Lian Pin Koh<sup>1</sup> and Jaboury Ghazoul

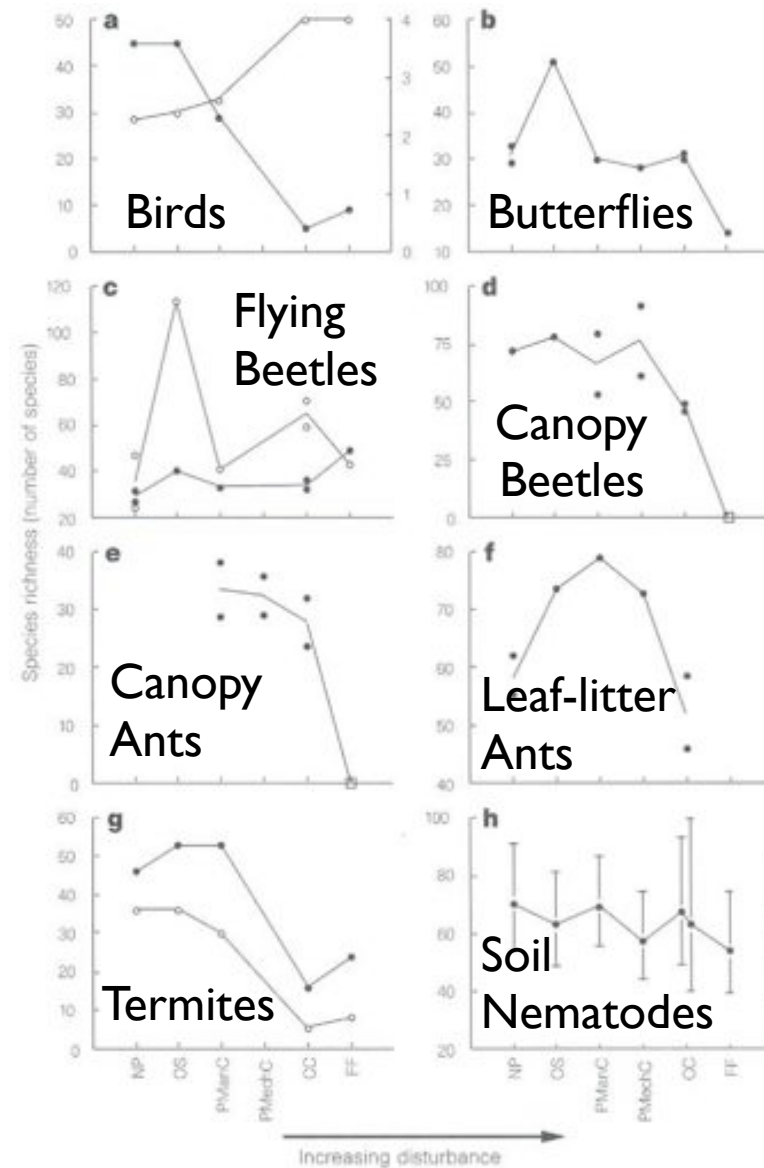
[www.pnas.org/cgi/doi/10.1073/pnas.1000530107](http://www.pnas.org/cgi/doi/10.1073/pnas.1000530107)

Lots of additional oil palm with little or no biodiversity loss

Increase in annual oil-palm production (millions tons)

# Enforce & Develop Best Management Practices

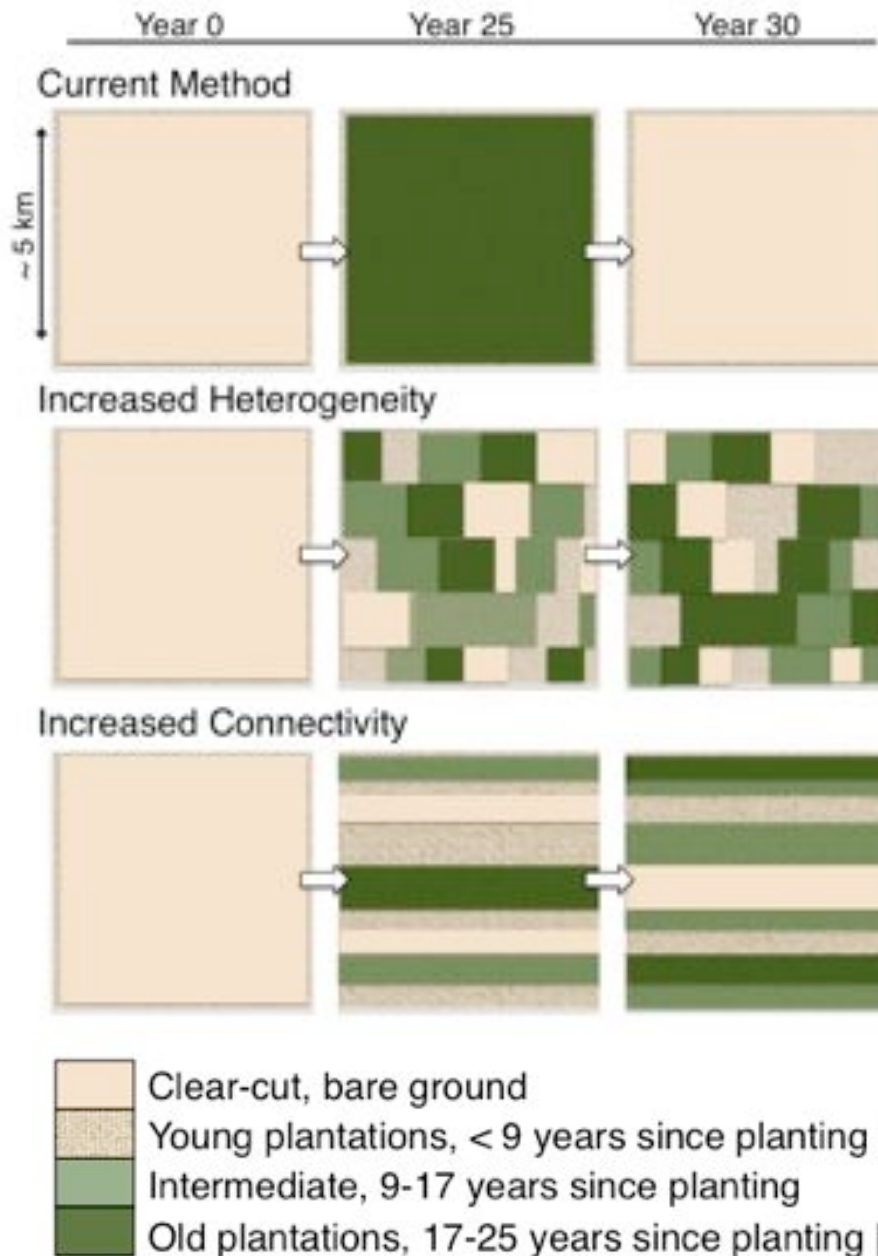
1. Prevent Poaching
2. Monitor Management Practices not Biodiversity



Lawton et al. 1998. *Nature*.



# Enforce & **Develop** Best Management Practices



Moderating microclimate  
and maintaining habitat  
heterogeneity throughout  
the oil palm lifecycle.

Potts & Luskin 2011 (in review)

# Avoiding Past Mistakes LCFS & Biodiversity in the Tropics Take Home Messages

1. Do it Right the First Time
  - a. Assess over *large* spatial scales
  - b. Plan for the *long* time horizons
2. Enforcement
  - a. Prevent Poaching
  - b. Monitor Management Practices
3. Adapt to Changing Conditions & New Knowledge

A photograph of a mountain range with dense green forests. The foreground shows a lush, green forest with various tree species. In the background, the mountains are shrouded in a thick mist or fog, creating a sense of depth and mystery. The sky is overcast with soft, grey clouds.

Thank you!